

Claims

What is claimed is:

1. A method for reducing fluid pressure in a pipe connecting a well to a remote location, the fluid normally flowing from the well, through the pipe, and to the remote location, the method comprising:

terminating the flow of the fluid through the pipe;
inserting a section of tubing into the pipe to define a space between the tubing and the pipe; and
introducing a pressurized gas into the space so that the gas passes through the space and displaces the fluid from the space and through the tubing, to reduce the fluid pressure in the pipe.

2. The method of claim 1 wherein the well is formed at a subsea location, wherein the fluid is production fluid, and wherein the remote location is a production facility on the surface of the sea.

3. The method of claim 1 wherein the gas is passed from the remote location, through the space in a direction towards the well, and wherein the displaced fluid passes through the tubing towards the remote location.

4. The method of claim 1 wherein the fluid in the tubing is also displaced.

5. The method of claim 4 wherein the displaced fluid from the space and the tubing are displaced to the remote location.

6. The method of claim 1 further comprising terminating the step of introducing, and then reducing the pressure in the space and/or the tubing so that any remaining production fluid in the pipe will be allowed to expand and flow to the remote location.

7. The method of claim 1 wherein the reduction of the pressure in the pipe lowers the temperature of the fluid to a value that will cause any hydrates in the pipe to melt.

8. The method of claim 1 further comprising removing the tubing from the pipe and starting the flow of the fluid from the well and towards the remote location.

9. A method for reducing fluid pressure in a pipe connecting a well to a remote location, the fluid normally flowing from the well, through the pipe, and to the remote location, the method comprising:

terminating the flow of the fluid through the pipe;

inserting a section of tubing into the pipe to define a space between the tubing and the pipe;

maintaining a fluid pressure on the tubing;

inserting a packer into the space to seal against fluid flow across the packer while maintaining the pressure on the tubing; and

then venting the fluid from the tubing to reduce the fluid pressure in the pipe.

10. The method of claim 9 wherein the well is formed at a subsea location, wherein the fluid is production fluid, and wherein the remote location is a production facility on the surface of the sea.

11. The method of claim 9 wherein the vented fluid is a gas that passes through the tubing to the remote location.

12. The method of claim 9 wherein, after the step of venting, the fluid in the space flows in the tubing and to the remote location.

13. The method of claim 12 wherein the vented fluid is a gas and wherein a gas/liquid interface is established in the tubing.

14. The method of claim 9 wherein the reduction of the pressure in the pipe lowers the temperature of the fluid to a value that will cause any hydrates in the pipe to melt.

15. The method of claim 9 further comprising removing the tubing from the pipe and starting the flow of the fluid from the well and towards the remote location.

16. The method of claim 9 wherein the locations of the tubing and the packer in the pipe are selected to ensure that the final equilibrium pressure is low enough to lower the temperature of the fluid in the pipe sufficiently to cause any hydrates in the pipe to melt.

17. A method for reducing fluid pressure in a pipe connecting a well to a remote location, the fluid normally flowing from the well, through the pipe, and to the remote location, the method comprising:

terminating the flow of the fluid through the pipe;

inserting a section of tubing into the pipe to define a space between the tubing and the pipe; and

pumping the fluid from the space and through the tubing to the remote location to reduce the fluid pressure in the pipe.

18. The method of claim 17 wherein the well is formed at a subsea location, wherein the fluid is production fluid, and wherein the remote location is a production facility on the surface of the sea.

19. The method of claim 17 further comprising inserting a packer into the space to seal against fluid flow across the packer so that the packer prevents the production fluid in the space between the remote location and the packer from being pumped.

20. The method of claim 17 wherein the step of pumping comprises providing a pump on the tubing, and activating the pump.

21. The method of claim 17 wherein the fluid in the tubing before the step of pumping is also pumped to the remote location.

22. The method of claim 17 wherein the reduction of the pressure in the pipe lowers the temperature of the fluid to a value that will cause any hydrates in the pipe to melt.

23. The method of claim 17 further comprising removing the tubing from the pipe and starting the flow of the fluid from the well and towards the remote location.

24. A method for reducing fluid pressure in a pipe connecting a well to a remote location, the fluid normally flowing from the well, through the pipe, and to the remote location, the method comprising:

terminating the flow of the fluid through the pipe;

inserting a first tubing into the pipe to define a first space between the tubing and the pipe;

inserting a second tubing into the first tubing to define a second space between the second tubing and the first tubing; and

introducing a pressurized gas into the second space so that the gas passes through the second space and displaces the fluid from the second space and through the tubing, to reduce the fluid pressure in the pipe.

25. The method of claim 24 wherein the well is formed at a subsea location, wherein the fluid is production fluid, and wherein the remote location is a production facility on the surface of the sea.

26. The method of claim 24 wherein the gas is passed from the remote location, through the second space in a direction towards the well, and wherein the displaced fluid passes through the tubing to the remote location.

27. The method of claim 24 wherein the fluid in the tubing is also displaced.

28. The method of claim 27 wherein the displaced fluid from the second space and the tubing are displaced to the remote location.

29. The method of claim 24 further comprising terminating the step of introducing, and then reducing the pressure in the second space and/or the tubing so that any remaining production fluid in the pipe will be allowed to expand and flow to the remote location.

30. The method of claim 24 wherein the reduction of the pressure in the pipe lowers the temperature of the fluid to a value that will cause any hydrates in the pipe to melt.

31. The method of claim 24 further comprising removing the tubings from the pipe and starting the flow of the fluid from the well and towards the remote location.

32. A method for reducing fluid pressure in a pipe connecting a well to a remote location, the fluid normally flowing from the well, through the pipe, and to the remote location, the method comprising:

terminating the flow of the fluid through the pipe;

inserting a section of tubing into the pipe to define a space between the tubing and the pipe;

inserting at least one pigging device into the space, the pigging device normally permitting the flow of fluid across the device and adapted to be expanded to create a seal across the space;

expanding the pigging device to create the seal; and

introducing gas into the tubing so that it flows through the tubing and into the space to displace fluid from the tubing into the space and displace the fluid and the expanded pigging device in the space in a direction towards the remote location to reduce the fluid pressure in the pipe.

33. The method of claim 32 wherein the well is formed at a subsea location, wherein the fluid is production fluid, and wherein the remote location is a production facility on the surface of the sea.

34. The method of claim 32 wherein the displacement of the pigging device sweeps out the fluid that is in the space between the pigging device and the remote location.

35. The method of claim 32 wherein, upon the displacement of the pigging device, the gas displaces fluid in the tubing to the space.

36. The method of claim 35 wherein the displacement of the pigging device in the space causes fluid in the space between the pigging device and the well to be displaced in a direction towards the remote location.

37. The method of claim 32 wherein a plurality of pigging devices are inserted into the space, and are selectively expanded and displaced to remove fluid from the pipe.

38. The method of claim 32 wherein the reduction of the pressure in the pipe lowers the temperature of the fluid to a value that will cause any hydrates in the pipe to melt.

39. The method of claim 32 further comprising removing the tubing and the pigging device from the pipe and starting the flow of the fluid from the well and towards the remote location.

40. A system for reducing fluid pressure in a pipe connecting a well to a remote location, the fluid normally flowing from the well, through the pipe, and to the remote location, the system comprising:

 a tubing disposed in the pipe to define a space between the tubing and the pipe; and

 a packer disposed in the space to seal against fluid flow across the packer while maintaining a gas pressure on the tubing; and

 means for venting the gas from the tubing to reduce the fluid pressure in the pipe.

41. The system of claim 40 wherein the well is formed at a subsea location, wherein the fluid is production fluid, and wherein the remote location is a production facility on the surface of the sea.

42. The system of claim 40 wherein the vented gas passes through the tubing to the remote location.

43. The system of claim 40 wherein, after the gas is vented, the fluid in the space flows in the tubing and to the remote location.

44. A system for reducing fluid pressure in a pipe connecting a well to a remote location, the fluid normally flowing from the well, through the pipe, and to the remote location, the system comprising:

a tubing disposed in the pipe to define a space between the tubing and the pipe; and

at least one pigging device disposed in the space and establishing a seal across the space; and

means for introducing gas into the tubing so that it flows through the tubing and into the space to displace the pigging device in the space in a direction towards the remote location to reduce the fluid pressure in the pipe.

45. The system of claim 44 wherein the well is formed at a subsea location, wherein the fluid is production fluid, and wherein the remote location is a production facility on the surface of the sea.

46. The system of claim 44 wherein the displacement of the pigging device sweeps out the fluid that is in the space between the pigging device and the remote location.

47. The system of claim 44 wherein the gas displaces fluid in the tubing to the space.

48. The system of claim 47 wherein the displacement of the pigging device in the space causes fluid in the space between the pigging device and the well to be displaced in a direction towards the remote location.

49. The system of claim 44 wherein the pigging device is adapted to allow fluid to pass through it.

50. The system of claim 44 wherein a plurality of pigging devices are inserted into the space, and are selectively displaced to remove fluid from the pipe.